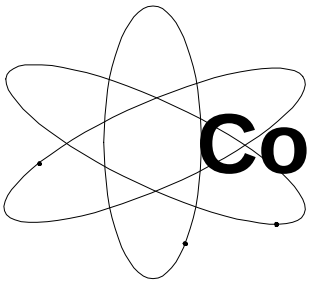
**US Army Corps**
**of Engineers**
Hydrologic Engineering Center



# Computer Program Catalog

August 1997

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## August 1997

US Army Corps of Engineers
Hydrologic Engineering Center
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# Table of Contents

# General Program Information

(Unless noted otherwise, the following applies to all programs)

1. Language/Transportability: Programs described herein are, for the most part, designed and written to be machine-independent; and, therefore, highly transportable. Most are written in ANSI STANDARD FORTRAN IV or FORTRAN 77.

2. Mainframe/Mini Systems: Programs are furnished to mainframe/mini computer users on diskette in FORTRAN source code form. Recipients are responsible for implementation on their system. Standard test data sets and output results are furnished with the programs.

3. Microcomputer Systems: Programs are furnished to microcomputer users on diskette(s) in executable form for immediate use on MS-DOS (2.1 or later) compatible systems. Standard test data and output results are furnished with the programs.

   Adaptation of selected Hydrologic Engineering Center (HEC) software to microcomputers is an ongoing project. Programs available for microcomputers are noted in the program description section.

4. Supporting Materials: In addition to the material supplied on diskette, the requester receives a user's manual. Please refer to the HEC Publications Catalog to order additional documents relevant to the program(s). These additional documents may be separate input descriptions, research documents, training documents, and/or technical papers.

5. Software Packages: Although most of the programs listed herein are designed to be used independently, certain programs may be used together, comprising what is sometimes referred to as a "package". These are noted in the program description section and are provided at no additional charge when ordering the fundamental component of the system.

# Ordering Information

Software listed herein may be obtained by Corps of Engineers and other United States federal government agencies by request to HEC. Other foreign and domestic government agencies, academic institutions, businesses, and private citizens may obtain the software from either the National Technical Information Service (NTIS) or vendors. Ordering information for NTIS is included below. Software not available from NTIS or vendors may be obtained directly from HEC. Limited numbers of copies of computer program user documentation may be ordered from HEC.

Vendors are public and private organizations that have obtained software from HEC and have agreed to distribute the current versions to requestors. Fees for software and services are determined by the vendor. In addition to program distribution, many of the vendors provide user support and other services. Separate Domestic (U.S.) and Foreign vendor lists are maintained by HEC and will be furnished upon request.

## NTIS Ordering Information

HEC software available from NTIS is for use on an MS DOS Personal Computer. The NTIS address is: Ordering, National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161; telephone (703) 487-4650, FAX (703) 321-8547. The cost includes software and documentation but does not include any technical support.

| Program | NTIS Number |
|---|---|
| HEC-1 | PB91-505222 |
| HEC-2 | PB91-506550 |
| HEC-5 | PB92-500263 |
| HEC-6 | PB94-501202 |
| COED* | AD-A204 559 |
| HEC-FFA | PB94-501350 |
| HEC-IFH | PB92-503598 |
| HMR52 | AD-A204 563 |
| HYCOST | PB92-500636 |
| MLRP | AD-A204 565 |
| PAS | PB92-500628 |
| STATS | AD-A204 567 |
| WQRRS | PB91-509984 |

*COED is an editor that is included with many of the program packages. Program descriptions in the following pages list supplemental programs included in the packages.

# Computer Program Support

HEC maintains and distributes a library of hydrologic engineering and planning related FORTRAN computer programs. The library includes programs developed by HEC staff members, programs developed by contractors for Corps use, and proprietary programs which have been acquired for Corps use.

Programs have been categorized into three groups to indicate the level of support (documentation, error correction, and code enhancement). A description of each level of support is presented below. The support level for each program is shown in the program description notes.

**Support Level 1** - Widely used, standard HEC programs, where significant experience exists in the application of such programs to current engineering problems. Source code enhancement/correction is ongoing and code recipients are periodically informed of changes. Distribution of Level 1 programs is not restricted.

**Support Level 2** - Developmental, or moderately used programs. Source code enhancement/correction is accomplished on a selected basis. Distribution of Level 2 programs is made upon request, but users should be aware of developmental nature of some of the programs, and limited support for others.

**Support Level 3** - Programs that fall into one or more of the following categories: (1) very specialized application areas, (2) seldom used, (3) marginally supported, (4) inadequately documented, (5) superseded or preliminary versions of HEC or contractor programs. Source code enhancement/correction is generally not performed. Distribution of Level 3 programs is not encouraged.

Program Descriptions by Technical Area

# Data Storage System (HEC-DSS)

## HEC-DSS Package

The HEC-DSS Package contains programs DSPLAY, DSSITS, DSSPD, DSSTS, DSSTXT, DSSUTL, DSSMATH, DSSSHF, SHFDSS, NWSDSS, WATDSS, DWINDO and REPGEN. A description of each program follows:

### DSPLAY, Display DSS

The DSPLAY program is a utility whose main function is to provide an easy means of displaying data stored in an HEC-DSS file. The data can be plotted or displayed in tabular form. Time-series and paired function data can be displayed by this program, with the limitation that they not be plotted together. For plotted data the time scale is automatically adjusted to provide a time interval that is suitable for the time presented. Paired function data is displayed with standard x and y labels. The PC implementation supports a wide variety of screen and hardcopy devices. The PC version requires the use of Graphic Software Systems Drivers which are distributed with the program. The UNIX version will plot to an “X device” or a postscript printer.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 550Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 2.0.1) |

### DSSITS, Enter Irregular Time Series in DSS

DSSITS is a utility program for entering irregular interval time series data into a DSS data base file. It is an easy-to-use "prompt driven" program that requests information from the user. It can be run interactively (i.e., input from the keyboard), or in a batch mode (input from a file).

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 350Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 3.6) |

## DSSPD, Enter Paired Data in DSS

DSSPD provides a means of entering paired function data into a DSS data base file. Paired function data (or paired data) is a group of data that represents a two variable relationship. An example is data that makes up a curve (e.g., a rating table or a flow-frequency curve). Several curves may be stored in the same record if one of the variables is the same. For example, several frequency-damage curves may be stored in the same record, where the curves may be residential, commercial, etc. A scale associated with the variable may be one of three types: linear, logarithmic, or probability. DSSPD is a prompt driven program that requests information from the user. It may be run interactively (i.e., input from the keyboard), or in a batch mode (input from a file).

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 350Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 3.4.4) |

## DSSTS, Enter Time Series in DSS

DSSTS is a utility program for entering regular interval time series data into a DSS data base file. It is an easy-to-use "prompt driven" program that requests information from the user. It can be run interactively (i.e., input from the keyboard), or in a batch mode (input from a file).

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 350Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 2.8) |

## DSSTXT, DSS Text Data Entry Program

DSSTXT is a program for storing and retrieving text data from a DSS file. DSSTXT is a "prompt driven" program that requests information from the user. It may be run interactively (i.e., from the keyboard), or in a batch mode with input commands from a file. Text to be stored may be in a file (regardless whether the program is run interactively or batch) or it can be entered from the keyboard. Text that is retrieved from a DSS file can be placed in a file or displayed on the screen.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 350Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 1.2.2) |

## DSSUTL, DSS Utility Program

The DSSUTL program provides a means of performing utility functions on data stored in the HEC Data Storage System (HEC-DSS). These functions include tabulating, editing, and copying data, and listing, renaming, deleting and copying records in a DSS file. The program also offers the capability of importing or exporting data for use by a program without DSS capabilities.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 550Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 6.8) |

## DSSMATH, Mathematical Utilities for DSS Data

DSSMATH enables mathematical manipulation of data stored in the HEC-DSS system. The program provides capabilities for arithmetic computations and transformations such as stage to flow, screening, and estimation of missing or erroneous values. The program may be used in an automated batch environment for processing real-time data, or it can be used interactively to perform ad hoc operations.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer versions** | **(MS DOS compatible; Standard: 580Kb Extended: 4 Mb)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | March 1995 (Version 2.0.5) |

## DSSSHF, Output DSS Data in SHEF Format

Utility for outputting DSS in the Standard Hydrometeorological Exchange Format (SHEF) for data transfer between real time data users. Also see SHFDSS for entering SHEF data into DSS.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 500Kb RAM)** |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | March 1995 (Version 2.2) |

## SHFDSS, Load SHEF Data in DSS

SHFDSS facilitates entry of data in the Standard Hydrometeorological Exchange Format (SHEF) into HEC Data Storage System (DSS) files.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 500Kb RAM)** |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | March 1995 (Version 2.6.1) |

## NWSDSS, Load NWS Data in DSS

NWSDSS is used to retrieve selected precipitation data from several NOAA formats and write the information to an HEC Data Storage System file. NWSDSS operates from a list of stations and time windows specified by the user. NOAA formats recognized are TD9654 and TD3240 for hourly precipitation data, TD9655 and TD3200 for daily data. Hourly data are written to the DSS file in the regular-interval time-series format. Daily data are written in an irregular-interval time-series format. A optional catalog function may be used to simply inventory the stations and their periods of record.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 500Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 5.3) |

## WATDSS, Load WATSTORE Data in DSS

Program WATDSS copies data from a file containing WATSTORE daily data format 3 or format B, and stores it in a DSS database file.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 350Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 2.4.1) |

## DWINDO, Interactive Data Entry and Editing

Program DWINDO is a generalized program which provides interactive entry and editing of DSS time-series data in a form mode. DWINDO screen forms must be made before use.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 500Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 2.1) |

## REPGEN, Report Generator

REPGEN provides a flexible means of generating a wide variety of tabular text reports from DSS data file. Report skeletons are used to define the form of the report. Data from the DSS file is inserted into the report skeleton to form the full reports. Data may be operated upon by a limited set of functions (e.g., SUM, AVE, MAX, etc.) before being written. Output may contain connected line graphics and other features supported by common printers and laser printers.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 560Kb RAM)** |
| | Support Material: | HEC-DSS User's Guide & Utility Program Manuals |
| | Date of Last Program Release: | March 1995 (Version 3.2.2) |

# PLANNING ANALYSIS

## HEC-FDA Package, Flood Damage Analysis Package with Risk-based Analysis

The Flood Damage Analysis (HEC-FDA) package replaces the old HEC-FDA package. The program is designed to expedite the Corps plan formulation and evaluation technical analysis for flood damage reduction studies. It includes risk-based analysis methodologies. HEC-FDA follows the Corps functional elements of a study involving coordinated study layout, hydrologic engineering analysis, economic analysis, and plan formulation and evaluation. It is used as the study evolves from the base without-project conditions analysis through the analysis of alternative plans for reducing flood damage using risk-based analysis methods. Technical analyses apply discharge-exceedance probability, stage-discharge, and stage damage functions with uncertainty. Hydrologic engineering also considers water surface profiles, levee overtopping, geotechnical levee failure, and wave overtopping of levees. Detailed structure inventories for development of stage-damage function with uncertainty are also available. Plans are evaluated as the expected annual damage associated with a given analysis year or the equivalent annual damage over the project life of the plan. Information on the flood risk performance and expected annual damage reduced is included in the results. Output includes tabular and selected graphics of information by plan, analysis year, stream, and damage reach for the plan. Plan comparisons may also be performed.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(Windows 95, NT, and Sun Solaris UNIX)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | September 1997 (Version 1.0) |

## DAMCAL, Damage Reach Stage-Damage Calculation

DAMCAL accesses information stored in a geographic multi-variable grid cell data base and develops damage potential relationships for (1) the existing land use condition and (2) any number of future land use conditions or specific land development proposals. The program may be used to evaluate such nonstructural alternatives as: relocation of structures from the floodplain, temporary structural protection, content removal in response to flood warnings, and combinations of the preceding. DAMCAL GIS capabilities will be incorporated into the new HEC-FDA program.

The contents of the grid cell data base (that contains the grid cell representation of all resources, land use and other grid data needed to perform the desired analysis) must be constructed in a specific format described in the User's Manual and further explained in "Guide Manual for the Creation of Grid Cell Data Banks," both available from the HEC.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 443Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | April 1994 |

## EAD, Expected Annual Flood Damage Computation

The new HEC-FDA program replaces the capabilities of EAD. HEC-EAD performs flood inundation damage computations required in the evaluation of floodplain management plans. HEC-EAD can compute: the damage for a specific flood event, the expected annual damage for one or more years, and the equivalent annual damage for a stated interest rate and period of analysis. HEC-EAD requires, for each index location and plan to be evaluated, the relationships of exceedance frequency and corresponding flow or elevation and, if needed, elevation versus flow and the economic relationship of elevation versus damage for each appropriate damage category.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 391Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | April 1994 |

## SID, Structure Inventory for Damage Analysis

The new HEC-FDA program replaces the SID capabilities. SID calculates an elevation versus damage function for individual or groups of structures and aggregates these functions into elevation damage relationships by damage category for each damage reach. Up to nine unique stage-percent damage functions may be defined for elements (such as basement, first floor, contents, etc.) of each structure. It accommodates an unlimited number of structures, up to 480 unique damage functions, 50 damage categories and 200 damage reaches. The program can also evaluate relocation of structures from the floodplain, temporary structural protection, content removal in response to flood warning, and combinations of the preceding. SID requires an inventory of structures (or groups of structures) with their particular attributes, standard stage damage functions, and damage reach assignments.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 550Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | April 1994 |

## SIDEDT, Structure Inventory for Damage Analysis Edit

The new HEC-FDA replaces the SIDEDT capabilities. The SIDEDT program is the older companion program to the SID program and it runs in batch mode. It is designed to assist in the management and maintenance of stage-damage function files and structure inventory files used as input to the SID program. The SIDEDT program assists in locating and correcting errors in a structure inventory file or a damage function file. In addition, it provides a wide range of options to aid in file merging, data selection, data manipulation, data modification and output selection. Data are input and output as character files containing attributes descriptive of individual structures, such as structure identification, beginning stage, etc. SIDEDT provides the capability of selectively reading all or some of these attributes from the input file. See separate description for the HEC-SIDEDTW newer companion program to the SID program.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 122Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | April 1994 |

**AGDAM, Agricultural Flood Damage Analysis**

The Agricultural Flood Damage Analysis (AGDAM) computer program calculates event and expected annual flood damage and area flooded by crop category and damage reach. Analyses are performed using crop loss functions for several crop categories, cropping patterns (area-elevation relationships), and magnitude, duration, and seasonal characteristics of frequency flood events. Expected annual damage values are calculated by crop category based on the determined frequency-damage relationships. Adjustments to the damage values may be made for multiple flood (replant) considerations and infrastructure damage potential. AGDAM is designed to function as a stand alone program or to interface with the HEC Data Storage System (HEC-DSS).

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 300Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | October 1989 |

**HEC-PBA, Project Benefit Accomplishment Package**

The Project Benefit Accomplishment Package (HEC-PBA) enables users to calculate flood damage and benefits attributed to Corps of Engineers projects for a single or multiple flood events. With the HEC-PBA package, a user can: (1) calculate agricultural and urban flood damage on a near real-time basis; (2) calculate damage reduction attributed to Corps projects from events; and (3) generate summaries of project benefit accomplishment for reports to higher authorities. The program is used by economists and planners, as well as water control personnel working in the real-time arena.

HEC-PBA consists of two computer programs. The programs operate in batch mode. The preprocessor (PREPBA) program processes and stores large amounts of data that remain stable over time into a format directly accessible to the analysis program. The analysis (PBA) program calculates the project inundation reduction benefit accomplishment associated with flood events and creates numerous output tables based on the reach and boundary information.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version:** | **(MS DOS compatible; 2Mb RAM)** |
| | Unix version: | EP/IX and SUN compatible: 2Mb RAM) |
| | Support Material: | User’s Manual (CPD-67) |
| | Date of Last Program Release: | February 1995 |
| | *Projected date of new release: September 1995* | |

**HYCOST, Small-Scale Hydroelectric Power Cost Estimates**

The HYCOST program is designed to compute advanced feasibility-level cost estimates for small scale hydropower projects. The program computes cost for the four principal types of facilities of a hydroelectric power installation: Power Plant, Switchyard and Transmission Lines, Hydraulics Facilities and Site Development. Facility costs computed by the program are in July 1978 dollars. The program provides the capability to update these costs to current dollars, apply a regional cost correction, add a contingency allowance and include indirect costs. Costs may be expressed in present value or discounted to annual values. Capacity and energy benefits may also be computed and compared with costs in a benefit-cost analysis. The program uses the cost estimating graphs and tables (with slight revisions) from Volumes 5 and 6 of "Feasibility Studies for Small Scale Hydropower Additions, A Guide Manual," the Hydrologic Engineering Center/Institute for Water Resources, U.S. Army Corps of Engineers, July 1979.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | **Microcomputer version** | **(MS DOS compatible; 105Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | July 1983 (Version 1.1) |

# RESERVOIRS

## HEC-5, Simulation of Flood Control and Conservation Systems

The HEC-5 program is designed to simulate the sequential operation of a reservoir-channel system with a branched network configuration. Any time interval from one minute to a month can be used and multiple time intervals can be used within a single simulation. Channel routing can be performed by any of seven hydrologic routing techniques. Reservoirs operate to (1) minimize downstream flooding; (2) evacuate flood control storage as quickly as possible; (3) provide for low-flow requirements and diversions; and (4) meet hydropower requirements. Hydropower requirements can be defined for individual projects or for a system of projects. Pump-storage operation can also be simulated. Sizing of conservation demands or storage can be automatically performed, using the safe yield concept, and economic computations can be provided for hydropower benefits and flood damage evaluation.

Two editions of the HEC-5 Package of programs are available: "overlayed" and "extended memory" (EM). While the basic programs are the same, the "EM" edition runs much faster and provides for 20 reservoirs and 40 control points; whereas, the "overlayed" edition provides for 7 reservoirs and 15 control points. The "overlayed" edition operates within the DOS 640K limit (575Kb RAM). The "EM" edition requires a 386 computer with 2Mb to 4Mb of memory. Both editions require a math coprocessor.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer versions** | **(see above paragraph)** |
| | Support Material: | User's Manual, Training Document 29 |
| | Date of Last Program Release: | March 1991 (Version 7.2) |
| | *Projected date of new release: Fall 1997* | |

The HEC-5 package includes MENU5, HEC-DSS PC Package, and COED. It also includes the following programs:

## CKHEC5, Input Data Checking Program for HEC-5

This program is designed to check HEC-5 input data for various errors based on instructions in the HEC-5 User's Manual (component of HEC-5 PC package of programs).

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 550Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | March 1991 |

## INCARD, Flow Conversion for HEC-5

This program is designed to read long continuous time series input data sets (BF-ER records for HEC-5) in tabulation intervals which are readily available, and convert them to one or more series of BF-EJ records based on the desired reservoir simulation time intervals and time spans (component of HEC-5 PC package of programs).

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | **Microcomputer version** | **(MS DOS compatible; 355Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | March 1991 |

## INFIVE, Interactive Input Preparation Program for HEC-5

This program is designed to allow the user to prepare data for HEC-5 interactively, by answering a series of questions. The results from the question and answer session produce a file containing all records needed to do the job. The individual record fields can subsequently be filled in using COED or MOD5, (component of HEC-5 PC package of programs).

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 231Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | March 1991 |

## MOD5, Interactive Input Modification Program for HEC-5

This program is intended to provide users of computer program HEC-5, who have a limited familiarity with the HEC-5 data structure (or are infrequent HEC-5 users), with the capability to modify existing HEC-5 data sets. MOD5 may also be used in conjunction with program INFIVE to develop HEC-5 data sets (component of the HEC-5 PC package of programs).

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 574Kb RAM)** |
| | Support Material: | User's Manual (Draft) |
| | Date of Last Program Release: | March 1991 |

## GATEREG, Spillway Gate Regulation Curve

This program will compute the gate regulation schedule curves for a reservoir utilizing the area capacity curves, the induced surcharge envelope curve, and a constant Ts which represents the slope of the recession leg of an inflow hydrograph. These curves are used to operate a gated spillway while the reservoir pool is rising under emergency conditions when communications have failed and in determining dam height for design purposes.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | Support Material: | User's Manual, Feb 1966 |
| | Date of Last Program Release: | April 1992 |

**HEC-PRM, Prescriptive Reservoir Model**

This program represents reservoir operation as a network-flow programming problem with flow, release, and storage decision variables. Goals of operation are defined formally with penalties related to and with upper and lower bounds on flow, release and storage. HEC-PRM prescribes flows, releases, and storages that meet the physical constraints and minimize system penalty. The program can be readily used only with HEC assistance at this time.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | April 1994 |

**HYDUR, Hydropower Analysis Using Streamflow Duration Procedures**

This program will analyze streamflow duration data and calculate estimates of power and energy potential for run-of-river type projects. It will also perform pre-reconnaissance level benefits and costs at proposed hydropower installations. Options are available that permit the user to specify the installed capacity of the plant, or allow the program to select the installed capacity based on a user supplied criterion. The options involving benefits and costs and automatic derivation of capacity should be used with great caution. The data used by these routines have not been updated nor have all routines been verified. Construction, and equipment investment, replacement, operation and maintenance costs are estimated from the installed capacity, operating head, and other pertinent information about the power site. Benefit calculations are determined from 1978 regional capacity and energy values developed by the Federal Energy Regulatory Commission for the Corps National Hydropower Study. The values are a function of the annual plant factor. The criterion used to select the installed capacity of the plant can be based on maximizing or minimizing a combination of costs, benefits, capacity or energy generation. The benefits and costs used in this program are intended only for pre-reconnaissance level studies.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 (FORTRAN source) |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | November 1986 |

**RESACT, Reservoir Area-Capacity Table by Conic Method**

This program will compute reservoir area-capacity tables for elevation increments of 1.0, .1 or .01 foot based on input elevation and area data.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | June 1990 |

**RESYLD, Reservoir Yield**

This program will perform a simulated operation study for a single reservoir with controls at the reservoir and one downstream control point. Operation is for water supply, power, water quantity and water rights, taking account of flood control and other storage restrictions at the reservoir, quantity and quality of inflow to the reservoir, evaporation, quantity and quality of local inflows downstream and channel and outlet capacities, as well as project requirements. Operation interval can vary, but usually a monthly interval would be used. Translatory and channel storage effects are ignored.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | August 1966 |

# RIVER HYDRAULICS

## HEC-2, Water Surface Profiles

The HEC-2 program computes water surface profiles for one-dimensional steady, gradually varied flow in rivers of any cross section. Flow may be subcritical or supercritical. Various routines are available for modifying input cross-section data; for example, for locating encroachments or inserting a trapezoidal excavation on cross sections. The water surface profile through structures such as bridges, culverts and weirs can be computed. Variable channel roughness and variable reach length between adjacent cross sections can be accommodated. Printer plots can be made of the river cross sections and computed profiles. Input may be in either English or metric units. See separate program description for the HEC-RAS system of software.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 455Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | May 1991 (Version 4.6) |

The HEC-2 microcomputer package includes: MENU2, EDIT2, PLOT2, SUMPO and COED. A description of each programs follows:

### EDIT2, HEC-2 Data Checker

The EDIT2 program serves as input data checker for computer program HEC-2.

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|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 190Kb RAM)** |
| | Support Material: | Training Document No. 26 |
| | Date of Last Program Release: | May 1991 |

### PLOT2, HEC-2 Graphics

The PLOT2 program provides cross-section, profiles and rating curve plots to the screen or a choice of HP pen plotters. Either a CGA, EGA, or VGA graphics card is required for screen display.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 475Kb RAM)** |
| | Support Material: | Training Document No. 26 |
| | Date of Last Program Release: | May 1991 |

### SUMPO, Interactive Summary Printout Using HEC-2

Program SUMPO is an interactive program which can build summary output tables from the HEC-2 TAPE95 file. Options allow the selection of predefined tables or the design of specific tables.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 200Kb RAM)** |
| | Support Material: | Training Document No. 26 |
| | Date of Last Program Release: | May 1991 |

**HEC-6, Scour and Deposition in Rivers and Reservoirs**

The purpose of this one-dimensional sediment transport model is to calculate water surface and sediment bed surface profiles by computing the interaction between sediment material in the streambed and the flowing water-sediment mixture. The total sediment load is computed for each cross section along with the trap efficiencies for clays, silts, and sands. The change in bed elevation, water surface elevation, and thalweg elevation are also computed for each cross section. Dredging can be simulated and reservoir deposition can be analyzed with the model.

Two editions of the HEC-6 program are distributed in the HEC-6 package: "overlayed" and "extended memory". While the basic programs are the same, the extended memory version runs faster and provides for up to 500 cross sections in a 10 stream segment dendritic network while the overlayed version only allows 150 sections. The overlayed version operates within the DOS 640K limit (570Kb RAM). The extended memory version requires a 386 (or better) computer with 2-4Mb extended memory and a math co-processor.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(see above paragraph)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | October 1993 (Version 4.1) |
| | *Projected date of new release:* | *Winter 1995* |

Microcomputer package includes: MENU6, PLOT2 and COED.

**HEC-RAS, River Analysis System**

HEC-RAS is an integrated system of software, designed for interactive use in a multi-tasking, multi-user network environment. The system is comprised of a graphical user interface (GUI), separate hydraulic analysis components, data storage and management capabilities, graphics and reporting facilities.

The HEC-RAS system is intended for calculating water surface profiles for steady gradually varied flow. The system can handle a full network of channels, a dendritic system, or a single river reach. HEC-RAS is capable of modeling subcritical, supercritical, and mixed flow regime water surface profiles.

The basic computational procedure is based on the solution of the one-dimensional energy equation. Energy losses are evaluated by friction (Manning's equation) and contraction/expansion (coefficient multiplied by the change in velocity head). The momentum equation is utilized in situations where the water surface profile is rapidly varied. These situations include mixed flow regime calculations (i.e. hydraulic jumps), hydraulics of bridges, and evaluating profiles at river confluences (stream junctions).

The effects of various obstructions such as bridges, culverts, weirs, and structures in the flood plain may be considered in the computations. The steady flow system is designed for application in flood plain management and flood insurance studies to evaluate floodway encroachments.

Special features of the HEC-RAS include: multiple plan analyses; multiple profile computations; and multiple bridge and/or culvert opening analysis.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS Windows: 3.1, 3.11, NT, Windows 95; 8Mb RAM)** |
| | Support Material: | User's Manual, Hydraulic Reference Manual, & Applications Guide |
| | Date of Last Program Release: | April 1997 (Version 2.0) |

**PAS, Preliminary Analysis System for Water Surface Profile Computations**

PAS predicts computed profile accuracy from stream geometry and reliability of Manning's roughness coefficient, n. Upstream and downstream data collection limits are estimated. The cost of developing stream geometry data by several survey methods is computed and displayed. Hydraulic parameter for up to five simplified eight-coordinate point cross sections are computed, displayed and used in regression equation to perform the predications. The program implements the findings of the document "Accuracy of Computed Water Surface Profiles," HEC, 1986.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 410Kb RAM)** |
| | Support Material: | User's Manual & Research Document No. 26 |
| | Date of Last Program Release: | July 1988 |

**UNET, One-Dimensional Unsteady Flow through a Full Network of Open Channels**

UNET simulates one-dimensional unsteady flow through a full network of open channels. In addition to solving the network system, UNET provides the user with the ability to apply several external and internal boundary conditions, including: flow and stage hydrographs; rating curves; gated and uncontrolled spillways; pump stations; bridges; culverts; and levee system. UNET was originally developed by Dr. Robert L. Barkau.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; Extended Memory: 4Mb)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | August 1997 (Version 3.2.0) |

# STATISTICAL HYDROLOGY

## HEC-FFA, Flood Frequency Analysis

The HEC-FFA program performs frequency computations of annual maximum flood peaks in accordance with the Water Resources Council "Guidelines for Determining Flood Flow Frequency," Bulletin 17B. This edition replaces the previous HEC-WRC program.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 300Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | February 1995 (Version 3.1) |

## HEC-4, Monthly Streamflow Simulation

The HEC-4 program will analyze monthly streamflows at a number of interrelated stations to determine their statistical characteristics and will generate a sequence of hypothetical streamflows of any desired length having those characteristics. It will reconstitute missing streamflows on the basis of concurrent flows observed at other locations. It will also use the generalized simulation model for generating monthly streamflows at ungaged locations based on regional studies. Users are advised that stochastic hydrologic modeling is still a developing technology, therefore, program output must be carefully reviewed.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | July 1986 |

## MLRP, Multiple Linear Regression Program

The Multiple Linear Regression program follows the procedures of "Statistical Methods in Hydrology" (Beard, 1962). Major features of the program are automatic deletion of independent variables (according to importance), combination of variables to form new variables, transformation of variables, tabulation of the residuals from the prediction equation and acceptance of input coefficients.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 165Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | July 1986 |

**REGFRQ, Regional Frequency Computation**

The REGFRQ program is used to compute the statistics of annual maximum hydrologic events that are necessary to a regional frequency study. Frequency statistics are computed for recorded events at each station and for each duration. Missing events are computed so that complete sets of events are obtained for all years at all stations while preserving all intercorrelations. The procedures will not be in accordance with the Water Resources Council Guidelines (see HEC-FFA program).

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | January 1987 |

**STATS, Statistical Analysis of Time-Series Data**

The STATS program is designed to reduce large volumes of time series data to a few meaningful statistics or curves. The program will perform the following analyses: (1) duration curves; (2) annual maximum events; (3) annual minimum events; (4) departures of monthly and annual values from respective means; and (5) annual volume-duration exchange of high and low events.

The data to be used as input to this program can be provided from a data file or the data can be accessed through HEC's Data Storage System (HEC-DSS). This latter capability provides for the analysis of output from other HEC programs. The frequency analysis may be analytical for data that tends to follow a theoretical distribution, e.g., annual maximum daily flows; or graphical for those data that do not tend to follow any known distribution, e.g., regulated flows. The input data may be transformed to logarithms for the statistical analyses, if so desired.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible)** |
| | Support Material: | Input Description, May 1987 |
| | Projected Date of Program Release: | Fall 1995 |

# SURFACE WATER HYDROLOGY

## HEC-1, Flood Hydrograph Package

All ordinary flood hydrograph computations associated with a single recorded or hypothetical storm can be accomplished with this package. Capabilities include rainfall-snowfall-snowmelt determinations; computations of basin-average precipitation from gages or hypothetical storms; unit hydrographs via direct ordinates or Clark, Snyder or SCS methods, or by kinematic wave transforms; hydrograph routing by level-pool reservoir, average-lag, modified Puls, Muskingum, Muskingum-Cunge, and kinematic wave methods; and complete stream system hydrograph combining and routing. Best-fit unit hydrograph, loss-rate, snowmelt, base freezing temperatures and routing coefficients can be derived automatically. Printer plot routines are also provided. HEC-1 may also be used to simulate flow over and through breached dams. Expected annual flood damage can also be computed for any location in a river basin. Interfaces with HEC-DSS routines for storing, retrieving, graphing, and tabulating data.

A hydrograph-array size of 2,000 ordinates is now available in a special version (4.0.1E) of HEC-1. The increased array size reduces limitations encountered when simulating long storms using short time intervals. The large-array version also allows greater flexibility in checking for numerical stability of simulation processes (e.g., kinematic runoff and routing computations).

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 571Kb RAM)** |
| | Support Material: | User's Manual, Training Documents 10 & 32 |
| | Date of Last Program Release: | September 1990 (Version 4.0) |

**Large-Array microcomputer version (MS DOS compatible; 386 PC with an 80387 math coprocessor, or a 486 PC; one 1.2Mb floppy diskette drive and a hard drive; required to have either 2.5Mb total memory for the large-array version or 640 base memory plus 3Mb of free hard-disk space for the virtual memory version)**

| | |
|---|---|
| Support Material: | User's Manual, Training Document No. 32 |
| Date of Last Program Release: | April 1991 (Version 4.0.1E) |

Microcomputer version includes: MENU1 (200Kb RAM), DSPLAY, DSSUTL, and COED.

## HEC-1F, Modified HEC-1 for Real-Time Water Control Systems[1]

HEC-1F is a computer program for making short- to medium-term forecasts of uncontrolled flood runoff. For further details, refer to Water Control Software section.

[1]Available to Corps only at this time.

**HEC-IFH, Interior Flood Hydrology Package**

The HEC-IFH program performs the analyses needed to characterize interior area flood hazards and to evaluate the performance of the potential flood reduction measures and plans. The menu-driven, interactive program is operational on the PC and facilitates the determination of the flood reduction potential of various measures by determining interior area stage-frequency relationships. The program computes the interior area runoff hydrograph and routes the hydrograph through a ponding area located adjacent to the line-of-protection, accounting for gravity or pump outlets to the main river. The program can simulate a variety of rainfall-runoff conditions, interior ponding areas, gravity outlets, pumping stations, and exterior stage conditions. The program is particularly useful for performing long, historical period simulations but can also simulate hypothetical events. The program makes extensive use of statistical, tabular, and graphical data representations, and report generation.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(80386 or higher processor with math coprocessor; MS DOS 3.0 or greater compatible; 3Mb of extended memory; 30 MB hard disk)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | October 1992 (Version 01.04.00) |

**HMR52, Probable Maximum Storm (Eastern U.S.)**

Computer program HMR52 computes basin-average precipitation for Probable Maximum Storms (PMS) in accordance with the criteria specified in Hydrometeorological Report (HMR) No. 52 (National Weather Service, 1982). That HMR describes a procedure for developing a temporal and spatial storm pattern to be associated with the Probable Maximum Precipitation (PMP) estimates provided in HMR No. 51, "Probable Maximum Precipitation Estimates - United States East of the 105th Meridian." Data required for application of the HMR52 program are: (1) X, Y coordinates describing the river basin and subbasin watershed boundaries; (2) PMP from HMR No. 51 (NWS, 1978); and, (3) storm orientation, size, centering, and timing. The program computes the spatially average PMP for any of the subbasins or combinations thereof. The HMR52 computer program will optimize the storm-area size and orientation in order to produce the maximum basin-average precipitation. The user must provide the desired centering and time distribution for the storm. The HMR52 program will produce a precipitation data file which can subsequently be input to a rainfall-runoff model, such as HEC-1.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 160Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | April 1987 |

**HYDPAR, Hydrologic Parameters**

HYDPAR accesses information stored in a geographic multi-variable grid cell database and develops and prints a report of watershed subbasin unit hydrograph and precipitation loss rate parameters. These may be used as input to the HEC-1 rainfall-runoff model using the automated linkage of the Data Storage System (DSS), where supported, or other analytical techniques. At present, the parameters that can be generated are (1) those needed for the U.S. Soil Conservation Service (SCS) Curve Number (CN) technique, and (2) those needed for the watershed modeling using subbasin imperviousness and the Snyder unit hydrograph procedure.

The contents of the grid cell data bank (that contains the grid cell representation of all resources, land use, and other grid data needed to perform the desired analysis) must be constructed in a specific format described in the User's Manual.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | **Microcomputer version** | **(MS DOS compatible; 221Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | October 1985 |

**UHCOMP, Interactive Unit Hydrograph and Hydrograph Computation**

Interactive version of the Unit Graph and Hydrograph Computation (UHHC) program. Queries user for necessary input data at interactive terminal to compute unit hydrographs, rainfall and losses, and runoff hydrographs. Generates standard project storm (SPS) and probable maximum storm (PMS).

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | **Microcomputer version** | **(MS DOS compatible; 83Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | July 1986 |

# UTILITIES

## COED, Corps Editor

COED is a text editor which may operate in either a line-edit mode, or in a full-screen edit mode. It provides the full range of capabilities of most editors, plus some additional features, in an easy to understand and useful format.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | **Microcomputer version** | **(MS DOS compatible; 440Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | November 1987 |

## HEC-LIB, HEC Subroutine Library

HEC-LIB is a set of utility library routines developed for HEC programs. These utilities include file assignments, date and time manipulation routines, character string manipulation routines, plus PREAD and DSS subroutines. HEC-LIB is provided as link ready libraries for PC computer systems (Microsoft and Lahey FORTRAN) and are available for several UNIX workstations.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Programmer's Manuals, Volumes 1 and 2 |
| | Date of Last Program Release: | March 1995 (includes DSS Version 6-J) |

# WATER CONTROL

The following Water Control Software programs are offered only on Sun and EP/IX UNIX workstations.

### ASYNC, Asynchronous Communication - Real Time[1]

ASYNC is a program that allows a UNIX computer to appear as though is were an interactive terminal while communicating to another computer system. ASYNC is most often used when it is necessary to have the computer automatically call another machine on some prescribed time schedule. In order to use the ASYNC program a script must be prepared indicating how to dialogue with the other computer.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | September 1993 (Version 4.1) |

### ASYNCI, Interactive Asynchronous Communication[1]

ASYNCI is a program that provides the interactive user with a means to dial another computer site through a local UNIX computer and operate normally at the remote computer, or transfer files between the two computers. It is similar the personal computer programs PC-TALK™ or CROSSTALK™. ASYNCI is only for interactive use on UNIX computers (although the remote computer can be of any type).

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | September 1993 (Version 3.2) |

### DATAST, Data Status[1]

Provides a display in text form showing where regular interval time series data is missing. The display covers those stations included in a station list over a specified period of time.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Example files only |
| | Date of Last Program Release: | June 1991 (Version 2.1) |

[1]Available to Corps only at this time.

**DATCHK and DATVUE, Data Screening Software**

DATCHK performs screening tests with user-specified criteria and optionally generates replacement values for flagged data. DATVUE displays data flagged by DATCHK and allows the user to edit replacement values.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | February 1995 (Version 1.1) |

**EXTRCT, Extract Data From DSS File**

EXTRCT copies time-series data in a given time window from one DSS file to another, transforming the data to a uniform, regular time interval. EXTRCT is primarily used to copy data from a master database file to a working file for use by simulation models.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Water Control Software - Forecast & Operations |
| | Date of Last Program Release: | March 1995 (Version 2.1) |

**GOEDEC, Convert GOES Data to SHEF[1]**

GOEDEC converts data messages from GOES "data collection platforms" (DCPs) into the SHEF format.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | December 1993 |

[1]Available to Corps only at this time.

**HEC-1F, Modified HEC-1 for Real-Time Water Control Systems[1]**

HEC-1F is a computer program for making short- to medium-term forecasts of uncontrolled flood runoff. The program is an adaptation of computer program HEC-1 and employs unit hydrographs and hydrologic routing to simulate runoff from a subdivided basin. Estimates of future rainfall can be accommodated. Runoff parameters for gaged headwater subbasins can be estimated (optimized) in real time. Blending of calculated with observed hydrographs can be performed. The program is a component of a comprehensive software system for real-time water control.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Water Control Software - Forecast & Operations |
| | Date of Last Program Release: | March 1992 |

**MODCON, Interactive Executive for Model Control[1]**

MODCON (Model Control) is an interactive, executive program designed to facilitate the use of components of the HEC's Water Control software system. The program can be used to specify the magnitude of input parameters for PRECIP, HEC-1F and HEC-5. For example, values for loss rates, future precipitation or specified future reservoir releases can be easily established with MODCON. MODCON also has the capability to create and send off (for execution) batch jobs that involve the sequential execution of a series of modeling programs. Summary displays of data status, input-parameters status, job status and program output can be viewed. It is also possible to execute the DSPLAY program to view plots or tabular displays of virtually any variables of interest, including observed data and results of precipitation-runoff and reservoir system simulations.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Water Control Software - Forecast & Operations |
| | Date of Last Program Release: | January 1994 |

**MONNWS, Monitor NWS Dedicated Line[1]**

MONNWS provides a means of storing AFOS products retrieved from the National Weather Service (NWS). The retrieval can be either from a 'hard-wired' connection to a NWS-AFOS computer, or from a network connection. Messages can be indexed according to product identifiers. Data stored by MONNWS can be viewed using program VUENWS according to the time the data was received, or by product identifiers.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | March 1995 (Version 5.5) |

[1]Available to Corps only at this time.

**PRECIP, Basin Precipitation Computations**[1]

Computer program PRECIP calculates area-average hyetographs from observed gage data. Individual gages may have missing records; each ordinate of the area-average hyetograph is based uniquely on the nearest gages for which data are available. Data from recording and non-recording gages may be used, as well as "bucket survey" type data. Data may be in irregular time intervals or in a regular interval that differs from the interval of the area-average hyetographs. Up to 200 gages may be used. There is no limit on the number of subbasins for which area-average hyetographs are to be developed.

The program is designed for use with the HEC Data Storage System (HEC-DSS). PRECIP retrieves gage data from a DSS file, and inserts calculated area-average hyetographs in the file. PRECIP is a component of a software package that includes capability for data acquisition and management, streamflow forecasting, reservoir system analysis and graphical display of data and simulation results. However, the program may also be used with DSS to develop hyetographs for hydrologic investigations associated with planning and design.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Water Control Software - Forecast & Operations |
| | Date of Last Program Release: | March 1993 (Version 1.8) |

**PREFOR, Pre-Forecast Data Preparation**[1]

Prepare the actual input data file for the forecast model (HEC-1F) from a generic base data file.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Water Control Software - Forecast & Operations |
| | Date of Last Program Release: | May 1991 |

**PREOP, Pre-Operations Data Preparation**[1]

Prepare the actual input data file for the reservoir operations model (HEC-5) from a generic base data file.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | Support Material: | Water Control Software - Forecast & Operations |
| | Date of Last Program Release: | April 1990 |

[1]Available to Corps only at this time

**REPLST, Report Lister**[1]

List a requested report out of the report system. See also REPUTL.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | March 1990 |

**REPUTL, Report Utility Processor**[1]

Report system utility to enter reports, edit report system index files, and other functions necessary to maintain multiple versions of a variety of reports or any other text information.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | March 1990 |

**VUENWS, View NWS Products**[1]

The VUENWS program provides the capability of viewing messages that are received from the NWS-AFOS computers and stored by MONNWS. Information may be displayed continuously as soon as it is received, or information received earlier may be redisplayed by users request according to the time of retrieval or by product identifiers.

| | | |
|---|---|---|
| NOTES: | Support Level: | 1 |
| | Support Material: | Water Control Software - Data Acquisition |
| | Date of Last Program Release: | May 1995 (Version 4.7) |

[1]Available to Corps only at this time

# WATER QUALITY

## HEC-5Q, Simulation of Flood Control and Conservation Systems (Including Water Quality Analysis)

This program simulates the sequential operation of reservoir systems for flood control and conservation purposes. Water quality analysis includes water temperature, three conservative and three non-conservative constituents, dissolved oxygen and a phytoplankton option. The flows to be released are determined by the program to meet at-site and downstream control point requirements. Twenty reservoirs, forty control points and any length of study period can be simulated on hourly, daily, or monthly intervals.

Reservoir inflow and quality are routed through the reservoir and the minimum allowable discharge for all downstream needs is computed. The discharge and all intervening local inflow (e.g., tributaries) are routed to all control points downstream of the reservoir. The thermal simulation of the reservoir and river system uses the equilibrium temperature approach. Violations of control point water quality requirements are minimized by mixing reservoir discharges from the different vertical levels allowed at the intake structure.

This program is a direct expansion, in subroutine form, of the water quantity portion of computer program HEC-5.

| NOTES: | Support Level: | 2 |
|---|---|---|
| | **Microcomputer version** | **(MS DOS compatible; Extended Memory: 2 - 10Mb)** |
| | Support Material: | User's Manual; Training Document No. 24; Technical Papers 88, 99, 104, 111, and 113 |
| | Date of Last Program Release: | Mar 91/Aug 91 (Version 7.2) |

The HEC-5Q package includes GEDA, HEATX, WEATHER, COED and the HEC-DSS Package of programs and test data.

## GEDA, Geometric Elements from Cross Section Coordinates

This program serves as a preprocessor for programs HEC-5Q and WQRRS (SHP). It prepares tables of hydraulic elements from HEC-2 input data. This program is furnished with computer program packages for HEC-5Q and WQRRS.

| NOTE: | Support Level: | 2 |
|---|---|---|
| | **Microcomputer version** | **(MS DOS compatible; 510Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | December 1987 |

## HEATX, Heat Exchange Program

This program is used to analyze the day to day variations in meteorologic variables at a given location and to compute equilibrium temperatures and coefficients of surface heat exchange between a water surface and the atmosphere. This program is designed to output coefficients necessary for the HEC-5Q, WQRRS, and THERMS programs. This program is furnished with HEC-5Q, WQRRS, and THERMS.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | **Microcomputer version** | **(MS DOS compatible; 58Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | May 1987 |

## WEATHER

Program WEATHER was developed to assist the user of the HEC-5Q and the WQRRS programs with the preparation of the required input weather data. The program reads a NOAA National Climatic Center weather data file and outputs a file in the proper input format for either the HEC-5Q or WQRRS programs.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 |
| | **Microcomputer version** | **(MS DOS compatible; 50Kb RAM** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | January 1990 |

## RESTMP, Reservoir Temperature Stratification

The reservoir temperature stratification model simulates temperature variations between horizontal strata within a reservoir on a monthly basis, given data on initial conditions, inflow rates, inflow temperatures, outflow rates, target downstream temperature ranges, evaporation, precipitation, insolation, air temperatures, specific outlet release requirements, if any, and the physical features of the dam and reservoir.

| | | |
|---|---|---|
| NOTES: | Support Level: | 2 |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | July 1984 |

## THERMS, Thermal Simulation of Lakes

This program determines the annual temperature cycle of an impoundment on a daily basis by means of a mathematical account of the external and internal heat balance of the reservoir due to variations in inflow, outflow and heat transfer between the water surface and the atmosphere. It is designed to accept output from the HEATX program which is included.

| | | |
|---|---|---|
| NOTES: | Support Level: | 3 (FORTRAN source) |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | February 1977 |

## WQRRS, Water Quality for River-Reservoir Systems

The WQRRS package of computer programs has been assembled to evaluate water quality (ecologic cycle) conditions in river and reservoir systems. The package provides vertical profiles of water quality conditions in reservoirs and longitudinal conditions in river networks of branching channels and/or around islands. This type of modeling is referred to as one-dimensional modeling. The package includes three separate modules (WQRRSR, WQRRSQ, and SHP) that are able to be integrated into a system analysis or to be used as separate programs. Three other programs (GEDA, HEATX, and WEATHER) are also included in the package (refer to the HEC-5Q program package for descriptions of these programs).

| NOTES: | Support Level: | 2 |
|---|---|---|
| | **Microcomputer version** | **(MS DOS compatible; 640Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | January 1989 |

### WQRRSR, Reservoir Water Quality

This program evaluates water quality conditions in a reservoir. The program is one-dimensional and is used to evaluate the vertical stratification for up to 18 physical, chemical, and biological parameters. This program is intended to interface on input (from upstream analysis) and output (for downstream analysis) with both the Stream Hydraulics Package (SHP) and Stream Water Quality (WQRRSQ) computer programs.

### WQRRSQ, Stream Water Quality

This program evaluates water quality conditions in a stream network of branching channels and/or around islands. It can be used to produce inflow quantity and quality input data for the Reservoir Water Quality (WQRRSR) program. This program also has the capability to accept inflow quantity and quality storm water runoff from the STORM computer program. The program is designed to accept hydraulic input from the Stream Hydraulics Package (SHP) which is included with this program.

### SHP, Stream Hydraulics Package

This program evaluates velocity, flow and depth at regular time intervals in a stream network of branching channels and/or around islands. The hydraulic analysis can be performed using input stage-discharge relationships, backwater equations, hydrologic routing, or the full unsteady flow equations at the user's option. SHP can interface with the "Stream Water Quality" program and/or accept input from the "Reservoir Water Quality" program for a river-reservoir system analysis.

| NOTES: | Support Level: | 2 |
|---|---|---|
| | **Microcomputer version** | **(MS DOS compatible; 533Kb RAM)** |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | January 1992 |

**WQSTAT, Water Quality Statistics (WQSTAT)[1]**

WQSTAT reads an output file of time series water quality data from the WQRRSQ program. This program provides a statistical analysis of simulated water quality data at a point. Eleven parameters, including flow, are analyzed for their mean and standard deviation, and their minimum and maximum values. If observed data are available, the mean error of reproduction and its standard deviation are evaluated. If water quality standards are available, the number of simulated values and the percent of time that they exceed the standards are tabulated. Only source code (FORTRAN) is available.

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|---|---|---|
| NOTES: | Support Level: | 3 (FORTRAN source) |
| | Support Material: | User's Manual |
| | Date of Last Program Release: | Mar 1981 |

[1]Available to Corps only at this time.

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